Equipment and Systems

WAC 296-826-400

Section Contents

YOUR RESPONSIBILITY:

To make sure all equipment and systems are operated and maintained safely

PIPING, TUBING, AND FITTINGS

REFRIGERATION STORAGE

Equipment and Systems

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Rule

WAC 296-826-40005

Electrical

You must

- Use electrical equipment and wiring on ammonia installations that's either of the following:
  - General purpose

    or
  - Weather resistant.
- Follow the electrical requirements found in another chapter, chapter 296-24 WAC, Part L for Class 1, Group D locations when the concentrations of ammonia in air are in excess of 16 percent by volume.

WAC 296-826-40010

Hose specifications

You must

- Make sure hose used in ammonia service and subject to container pressure meets both of the following:
  - The Joint Rubber Manufacturers Association, RMA-IP-14, Specifications for Anhydrous Ammonia Hose 7th Edition 2003

    and
  - The Fertilizer Institute “Hose Specifications for Anhydrous Ammonia.”
- Make sure hose assemblies are able to withstand a 500 psig pressure test.
- Follow Table 4 for hose specifications.

-Continued-

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Hose specifications (continued)

Table 4
Hose Specifications

If you have	Then
Hose subject to container pressure	• Design it with a minimum: – Working pressure of 350 psig **and** – Burst pressure of 1750 psig
Hose and their connections	• Design them for the maximum low side working pressure when located on either: – The pressure reducing valves on devices discharging to atmospheric pressure **or** – The low pressure side of flow control. • Design, construct, and install so there's no leakage when connected.
Liquid transfer hose that isn'tdrained of liquid upon completion of transfer operations	• Equip with an approved shut off valve at the discharge end. • Prevent excessive hydrostatic pressure in the hose.
Hose with an outside diameter one-half inch and larger	Make sure the hose is marked and legible at 5 foot intervals.

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Rule

PIPING, TUBING, AND FITTINGS

WAC 296-826-40015

General requirements for all systems

You must

- Prohibit the use of cast iron fittings.
  - The use of malleable or nodular iron such as Specification ASTM A47 or ASTM A395 is permitted.
- Make sure all metal flexible connections for permanent installations have a minimum working pressure of 250 psig
- Make sure all pipes, tubes, and fittings used for ammonia service meet all of the following:
  - Made of material with a design pressure at least equal to the maximum service pressure.
  - Well supported and have provisions for all of the following:
    - Expansion
    - Contraction
    - Vibration
    - Jarring
    - Settling.
- Protect all exposed pipes from damage resulting from undue strain including:
  - Moving machinery
  - The presence of vehicles.
- Use ammonia resistant joint compounds.
- Make sure, after assembly, that all piping and tubing are leak free at a pressure not less than the normal operating pressure of the system.

WAC 296-826-40020

Nonrefrigerated systems

You must

- Make sure piping on nonrefrigerated systems is:
  - ASTM A-53-2004 Electrical Resistance Welded and Electric Flash Welded Pipe or equal. In addition piping needs to be:
    - At least schedule 80 when joints are threaded.
    - At least schedule 40 when joints are either welded or welded and flanged.
- Prohibit the use of piping or tubing made of any of the following:
  - Brass
  - Copper
  - Galvanized steel.

WAC 296-826-40025

Systems mounted on trucks, semi-trailers, and trailers

You must

- Make sure all piping, tubing, and fittings are:
  - Securely mounted
  - Protected against physical damage.

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Rule

REFRIGERATED STORAGE

WAC 296-826-40030

Refrigerated storage compressors

You must

- Make sure compressors have all of the following:
  - Their own driving unit
  - Discharge pressure that's governed by the condensing conditions
  - Suitable compressor operation controls based on the load pressure in the container
  - At least 2 compressors, either of which is of sufficient size to handle the intended loads
  - Standby equipment equal to the largest normally operating piece of equipment installed when more than 2 compressors are provided
  - Automatic controls installed to prohibit the operation of alternate compressors unless the controls will function with alternate compressors.
- Make sure compressors are sized to operate with a suction pressure that's both of the following:
  - At least 10 percent below the minimum setting of the safety relief valves on the storage tank
  - Able to withstand 120 percent of the design pressure of the tank.
- Install an oil separator of suitable size in the compressor discharge line that's both:
  - Designed for at least 250 psig

    and
  - Equipped with a drain valve and gauging device.

WAC 296-826-40035

Refrigeration load

You must

- Make sure the total refrigeration load includes the loads imposed by all of the following:
  - Heat flow into the container caused by the temperature difference between both:
    - The ambient temperature

      and
    - The design storage temperature
  - Heat flow into the tank caused by maximum sun radiation
  - Filling the tank with ammonia warmer than the design storage temperature.
- Provide emergency power capable of handling loads imposed by both of the following:
  - The temperature difference between the ambient temperature and the design storage temperature

    ˜ **and**
  - Sun radiation.

Note:

Emergency power isn't necessary for facilities able to effectively vent vapors when the refrigeration system isn't operating.

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Rule

WAC 296-826-40040

Separators for refrigerated storage

You must

- Install an entrainment separator, of suitable size and design pressure, in the compressor suction line that's equipped with both of the following:
  - A drain valve

    and
  - A gauging device.

WAC 296-826-40045

Automatic control equipment for refrigerated storage

You must

- Install an emergency alarm to detect minimum and maximum allowable operating pressure changes.
- Install an emergency alarm and shut off in the condenser system to detect excess discharge pressure caused by the failure of the cooling medium.

WAC 296-826-40050

Other refrigerated storage equipment

You must

- Discharge ammonia to storage by using either:
  - A receiver with an automatic float valve

    or
  - A high pressure liquid drain trap of suitable capacity.
- Make sure receivers are:
  - Designed for at least 250 psig

    and
  - Equipped with all of the following:
    - Necessary connections
    - Safety relief valves
    - Gauging devices.
- Cover insulated containers and pipelines with material that meets all of the following:
  - Thick enough for the temperatures it will be exposed to
  - Supported
  - Weather and fire resistant.

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Rule

WAC 296-826-40055

Compressors for refrigerated systems

You must

- Make sure condensers are designed:
  - For at least 250 psig

    and
  - To manually or automatically purge noncondensibles.

Note:

- Condensers may be cooled by any of the following:
  - Air
  - Water
  - Air and water.

You must

- Make sure compressors used for refrigerating ammonia meet all of the following:
  - Are connected to plant piping with shut off valves located as close as practical to compressor connections
  - Have a safety relief valve that's both:
    - Large enough to discharge the full capacity of the compressor

      and
    - Connected to the discharge and placed before any shut off valve
  - Have an oil separator on the discharge side, where necessary to prevent contamination.
  - Have a drainable liquid trap or other adequate method on the compressor suction to minimize the entry of liquids into the compressor.
  - Pressure gauges on the suction and discharge ends graduated to at least one and one-half times the maximum pressure that can develop.